

The Role of Inclusive Finance in China's Economic Growth: Empirical Evidence from Quantile Regression on Panel Data

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Abstract. Inclusive finance is one of the key topics of recent research. Researchers found that in the process of economic development, inclusive finance serves a crucial function. However, there is still no unified explanation for the role of inclusive finance's disaggregated indexes (coverage breadth, usage depth and level of digitalization) in economic development. Therefore, by collecting panel data from 31 provinces and analyzing through quantile regression approach, this paper studies the relationship between the Peking University Digital Financial Inclusion Index of China (PKU-DFIIC) and each province's economic development, and further investigates whether the disparity in regional economic development may be closed by the advancement of inclusive digital finance. It is discovered that the coverage breadth, usage depth and digitization level can promote economic growth. The largest contribution to closing the regional economic development gap can be made via coverage breadth, while the usage depth plays the greatest role in promoting economic expansion. The eastern area has less economic expansion than the regions of the center and west as a result of the advancement of inclusive digital finance, which may help to close the economic development disparity in the regions. Finally, this paper proposes that people should encourage the creation of equitable digital inclusive financing policies, following the strategy of expanding coverage first, then improving the usage depth in the regions of the center and west, and to balance the advancement of inclusive digital finance among regions, different actions should be taken in different areas with varied levels of economic growth.

Keywords: Digital inclusive finance; economic growth; regional economy; quantile regression analysis.

1. Introduction

According to the Plan for Advancing the Development of Financial Inclusion (2016–2020) issued by the State Council, China's inclusive finance strategy was established for the first time. All social classes and organizations with a need for financial services can access appropriate and cheap and effective financial services thanks to inclusive financing, which is founded on the requirement of opportunity equalization and the sustainable business practice premise. Inclusive financing primarily serves small and micro-businesses, remote residents, farmers, low-income urban residents, the poor, people with disabilities, and seniors. Inclusive financing is committed to effectively enhancing the coverage, accessibility and satisfaction with financial services, and improving the sense that people have access to financial services, especially for clients to obtain financial services with reasonable prices, convenience and safety in time.

At present, the following implementation plans are proposed for the inclusive financing policy:

- (1) Encourage large banks to speed up the construction of small and micro enterprise franchises.
- (2) Encourage banking and non-bank payment institutions to provide secure and reliable online payment, mobile payment and other services to rural regions.
- (3) Ensure that there are institutions in every township and village, and basically complete the full coverage of bank physical outlets and insurance services at the township level.
- (4) Support relevant banking institutions to deploy POS machines, automatic teller machines and other machines in rural areas.

China's economic growth has now reached a "new normal", facing the dual pressures of downward economic growth and industrial restructuring. Building a diverse financial system and broadening the range of financial services is crucial for China's economic progress. However, from the existing

research literature, research on the connection between inclusive finance disaggregated indices and economic growth is comparatively understudied. Therefore, this paper uses the data from the 31 provincial panel in China from 2016 to 2020 to regress and quantitatively analyze the results of the PKU-DFIIC on regional economic growth and the imbalance of regional economic development. The study presented in this paper is intended to support the growth of the regional economy by serving as a theoretical foundation and guide for the creation of an inclusive financial system.

To deeply study the specific role of digital inclusive financing in economic development, this paper also makes an in-depth and detailed study on if developing inclusive digital finance can support economic growth and reduce the economic development gap, which has very important theoretical and practical value. On the one side, the growth of the digital economy is a new phenomenon in recent years, and its theoretical construction is still in the ascendant. The research on its economic impact in this paper can deepen people's understanding of digital economy and improve the economic effect theory of digital finance. On the other side, it is essential to encourage the growth of under developed areas in order to achieve balanced development among areas and narrow the economic growth gap between regions. This paper can provide some reference for policy making to encourage the expansion of inclusive finance and narrow the regional economic development gap. The majority of writings emphasize how inclusive finance can help close the gap between urban and rural areas, while this article provides theory as well as empirically based explanations on how inclusive financing narrows the economic development gap between regions.

This document has the following structure: Part 2 builds panel data for analysis, which includes the analysis of benchmark model, the regression analysis of inclusive financing index and the regression analysis of different regions; Part 3 shows the empirical results; Part 4 discusses the research results. Part 5 expounds this paper's conclusion.

2. Methodology

The document selects panel information from 31 Chinese provinces from 2016 to 2020 as the study sample, and the data is sourcing from Institute of Digital Finance Peking University (IDF) and the National Bureau of Statistics.

2.1 Variable Definition

The main concern of this essay is how PKU-DFIIC affects economic growth. In light of this, the study also examines how inclusive finance affects the disparity in regional economic development. Therefore, it is necessary to discuss not only the absolute impact of digital inclusive financing on economic growth, but also the relative impact differences on different regions. Most of the variables used to describe the imbalance of regional development in the existing literature mainly include Theil index, coefficient of variation method and Gini coefficient method, but most of them use one index to summarize the regional development differences within a country or region. If such indicators are used, the empirical research needs to use more macro-level data. In addition, these indicators can only measure the relative effect of inclusive financing on regional economic development, but it is difficult to measure the absolute impact.

Considering comprehensively, GDP is the explanatory variable utilized in this study. At the same time, using the panel quantile regression method, the absolute and relative impact results of inclusive financing on economic development can be analyzed. The explanatory variables of this paper are digital inclusive financing index released by IDF and its three sub-indexes, breadth of coverage, depth of usage and level of digitalization. The variables in Table 1 are measured as follows.

Table 1. Definition and Measurement of Variables

	Variable Definition	Measurement
GDP	Gross regional domestic product	Regional economic development level (in ¥ 100 million)
DFI	Digital financial inclusion index	Index sourced from IDF
Coverage	Breadth of coverage	Sub-index sourced from IDF
Depth	Depth of Usage	Sub-index sourced from IDF
Digit	Level of digitalization	Sub-index sourced from IDF

2.2 Model Construction

The impact of inclusive funding development on regional economic growth and its differences is the second primary concern of this essay, so the panel quantile regression model fits the research of this paper very well. By regressing different percentiles of regional GDP, different regions with varying rates of economic growth can be compared in terms of how inclusive financing development affects economic growth, and whether the difference will narrow the gap of economic development level between regions. Therefore, this paper constructs the following panel quantile regression model, where $GDP_{i,t}$ represents the GDP of the i province in the t year, which is used to determine how advanced an economy is, and $DFI_{i,t}$ represents the digital inclusive financing index.

$$GDP_{i,t} = \beta_0 + \beta_1 DFI_{i,t} + \varepsilon_t \quad (1)$$

2.3 Hypothesis Development

Hypothesis 1: The degree of regional economic development can be raised by the development of inclusive finance.

Hypothesis 2: The coverage, depth and digit degree of the secondary indicators of Inclusive Financing can promote economic growth. Among them, while the depth is most important for fostering economic growth, coverage is more important for closing the gap in regional economic development.

Hypothesis 3: The regions of the center and west are more affected by the development of digital inclusive funding than are the eastern regions in terms of economic growth.

3. Empirical Results

3.1 Benchmark Model Regression

To prove the economic growth effect of digital inclusive financing on regions with different economic development levels, this paper uses panel quantile regression model for empirical test. According to most quantile regression studies, this paper selects 10%, 25%, 50%, 75%, 90% five quantiles for fixed effect panel quantile regression [1]. Table 2 displays the results of the regression.

Table 2. Regression results of the benchmark model

Variable	10%	25%	50%	75%	90%
DFI	442.5568	252.4454	149.5338	161.3773	102.0846
Observed value	155	155	155	155	155

The relationship between inclusive financing and economic development should be attributed to the theory of financial development and financial repression at the earliest [2]. Scholars generally agree that financial progress can encourage economic expansion, and examine the contribution of financial development to economic expansion from the aspects of mobilizing savings, optimizing resource allocation, promoting risk management, facilitating transactions and improving corporate governance [3]. Chinese scholars have also made active research on this issue, and most of them believe that financial development can promote economic growth [4].

In Hypothesis 1, this paper is concerned with the economic growth effect of digital inclusive financing index on regions at different quantiles of economic development level. From the regression results, it is evident that equitable funding contributes to economic growth at all percentiles, that is to say, digital inclusive financing promotes regional economic growth, and this economic growth effect is basically negatively correlated with percentile. In areas with the lowest economic development level of 10%, the regional GDP will increase by 44.25568 billion yuan for every point of digital inclusive financing increase. With the increase of quantile, the regression coefficient gradually decreased from 442.5568. By the 90% percentile, the regional GDP will increase by 10.20846 billion yuan each every step toward inclusive finance. In other words, the effects of digital inclusive financing on economic growth are in fact different: the lower the economic development status are, the greater the economic growth effects of digital inclusive financing. Hypothesis 1 of this paper has been verified, so if digital inclusive financing can be promoted to grow synchronously in different regions, the economic development level gap between regions will gradually narrow to a certain extent.

3.2 Sub-Index Regression

PKU-DFIIC consists of three sub-indexes breadth of coverage, depth of usage and level of digitalization. In order to further verify the different effects of these dimensions on economic growth, this paper makes an empirical regression of the mentioned sub-indexes, and Table 3 and Figure 1 display the outcomes.

Table 3. Regression results of sub-indexes of PKU-DFIIC

Variable	10%	25%	50%	75%	90%
Coverage	394.2864	237.5850	130.2115	97.75569	38.57624
Depth	410.6740	218.9296	139.9411	138.6742	99.45031
Digit	252.6199	139.0202	188.3039	190.1312	121.5152
Observed value	155	155	155	155	155

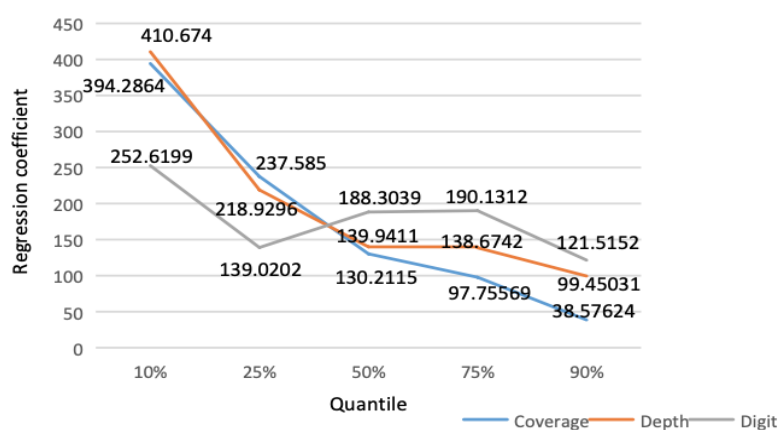


Fig. 1 Coefficients of sub-indexes of PKU-DFIIC to economic growth at different quantiles
(Photo credit: Original)

Increasing the depth and breadth of financial services, fostering the equitable distribution of financial resources across the entire society, and enhancing resource utilization effectiveness will not only support economic growth and income equity but also maintain the stability of a nation's financial system [5]. From the regression results, both the coverage breadth index and the usage depth index play a big part in encouraging economic growth, and both of them decline with the increase of quantiles. This shows that improving the coverage and depth of digital inclusive financing can effectively encourage economic expansion and reduce regional disparities in economic development. Figure 1 shows that the coefficient difference between the lowest and highest quantiles of coverage index is 90.22%, while the difference between depth index is 75.78%. Therefore, coverage breadth plays a bigger part in reducing the disparity in regional economic growth. The regression coefficient

of usage depth index is larger than that of coverage breadth index, which indicates that depth has a greater effect on encouraging economic expansion. The digit index has also played a part in fostering economic expansion. However, for those provinces located in the lower quantiles, the promotion of digit to economic growth is far less significant than the other two.

To sum up, digital inclusive financing narrows the regional economic development gap by alleviating financial repression. Coverage breadth index has the most close relationship with alleviating financial repression, so it is most effective at reducing the disparity in regional economic development. The higher the usage depth, the higher the per capita business volume and the more obvious the role of promoting economic growth. The degree of digitalization mainly reflects the value of inclusive financing, that is, the degree of convenience and benefits, which should also promote economic growth. However, for areas with relatively backward economic development, the role of digital inclusive financing is mainly achieved by expanding coverage and improving depth degree, and the role of digit is not significant.

3.3 Regression of Different Regions

Through theoretical analysis, this paper argues that the more economically underdeveloped areas, the greater the effect of inclusive financing on economic development, so the spread of inclusive funding can narrow the regional disparity in economic development. In China's economic development process, there are obvious regional disparities. The eastern region has experienced significant economic growth, while the regions of the center and west are relatively backward. Therefore, for regression, this study separates the data into three regions: eastern, central, and western., and the National Bureau of Statistics' website provides the division criteria. The outcomes of the regression are displayed in Table 4, Table 5, and Figure 2.

Table 4. Regression results of eastern region

Variable	10%	25%	50%	75%	90%
DFI	199.0990	34.00034	53.15779	132.0702	88.54109
observed value	60	60	60	60	60

Table 5. Regression results of central and western regions

Variable	10%	25%	50%	75%	90%
DFI	158.1095	203.9762	124.7267	130.5904	29.40740
observed value	95	95	95	95	95

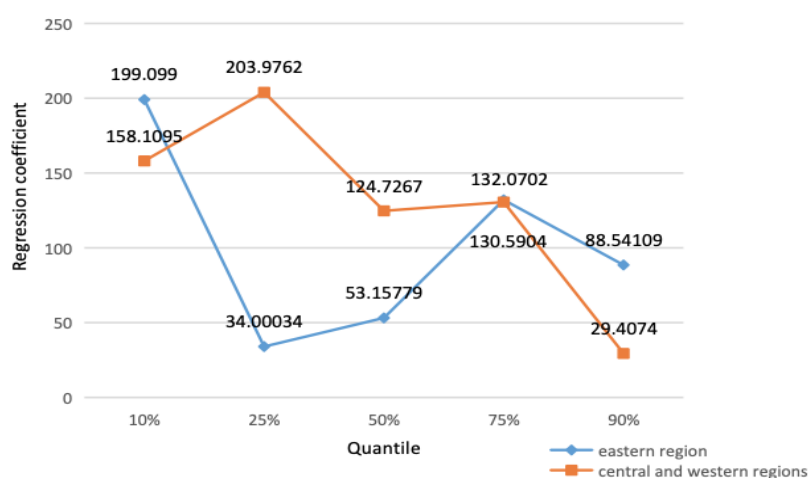


Fig. 2 Coefficients of PKU-DFIIC to economic growth at different quantiles in different regions (Photo credit: Original)

The research on the impact of inclusive finance on regional economic development is presented in two documents. A document discusses the micro-mechanism of digital inclusive financing's positive

effect on economic expansion. The expansion of digital finance, according to the report, fosters entrepreneurship, which fosters inclusive economic growth, and secondly promotes residents' consumption by alleviating liquidity constraints and facilitating residents' payment [6, 7]. Other researchers have looked at the varied effects of digital finance on rural financial demand [8]. Another body of literature used inter-provincial panel data to research the effects of inclusive finance growth on regional economic growth [9]. The study has generally agreed that digital finance promotes economic development.

Based on the above literature review, the following results can be derived: First of all, the regression findings demonstrate that the growth of digital inclusive financing encourages economic expansion and narrows the gap within the area. Secondly, from the perspective of regression coefficients, as shown in Figure 2, the regions of center and west are basically higher than the regions of east. This indicates that when digital inclusive funding develops, the economic gap between the central and western and eastern areas as well as the disparity in regional economic development are both reduced. Thirdly, at the lowest 10% quantile, compared to the central and western regions, the eastern region's regression coefficient is higher. This shows that the economically backward counties in the eastern region can benefit more from the growth of inclusive finance than those in the regions of the center and west. Because the economically backward counties in the eastern region are geographically closer to the economically developed regions, so they are relatively better at receiving economic radiation from the economically developed regions and other conditions for economic development. If digital inclusive financing develops locally, it can promote economic growth to a greater extent.

Through empirical analysis, according to some researchers, enhancing the level of inclusive funding development can help to decrease the income gap between urban and rural areas, but the effect of this role is still very limited [10]. In terms of the construction of inclusive financing system, the most important thing is to strengthen infrastructure construction and financial service product innovation to improve the standard of inclusive financing in rural areas.

3.4 Further Analysis

The findings above demonstrate that inclusive funding has a distinct impact on economic growth, and the economic growth benefit of digital inclusive funding will be larger the more backward the economic development is. This influence can be called as the regional convergence effect of inclusive financing. However, the extent to which inclusive financing development narrows the economic development gap between regions is determined by differences in the growth rates of inclusive financing. If the development of digital inclusive financing in economically developed areas is much faster than that in economically underdeveloped areas, it will create the so-called "digital divide": The spread of digital inclusive funding won't help close the economic development gap across areas; instead, it will make it wider.

In order to further explore whether the growth of inclusive financing has expanded or narrowed the regional economic growth gap in reality, the research calculates the average value of the difference between the digital inclusive financing index in 2020 and 2016 and according to the grouping of the regions of the east, center, and west. The data are shown in Table 6.

Table 6. PKU-DFIIC Growth of annual GDP statistics of each province by region

Area	Average value of digital inclusive financing index difference between 2020 and 2016
Eastern Region	121.27
Central and western Regions	104.21

Obviously, the digital inclusive financing index in the eastern region is growing rapidly, but the difference is not big. In this case, digital inclusive financing has narrowed the economic development gap between cities, although the narrowing rate is not large. Because the development speed of

inclusive finance in economically backward cities is slightly slower. Regarding the inclusive financing index's state of development, if the growth of inclusive financing in economically backward cities can be accelerated in the future, the convergence effect of economic growth between cities will be greater. In a word, as far as the economic growth effect is concerned, the development of digital inclusive financing has brought "digital dividend" at the city level and narrowed the economic development gap between regions. The conclusion of this paper is basically same with the research conclusion of Li Zhou and Angang Hu on digital dividend and digital divide [11, 12].

4. Suggestions

The research conclusion of this paper has clear policy implications, specified as follows.

(1) Implementing the priority development strategy of digital finance: the creation of digital inclusive financing has the potential to significantly boost economic growth, but also narrow the economic development gap between regions. Therefore, the government should take a proactive role in advancing equitable finance, particularly in the development of digital systems and infrastructure.

(2) Creation of inclusive digital financing in economically underdeveloped regions should follow the strategy of expanding coverage first and then enhancing depth. Digital inclusive financing has a natural development process from breadth to depth, and it is relatively easy to expand the coverage.

(3) Balancing regional development of inclusive financing: At present, there is still a "digital divide" to a certain extent in China, which is manifested in the fact that economically developed regions have a higher level of inclusive financing development than economically undeveloped regions. In order to further develop the economy and reduce the economic development disparity between regions, the government should formulate corresponding policies to narrow the gap of inclusive financing, and implement a targeted regional development strategy of inclusive financing, so as to promote the integration of financial resources within rural and urban areas, and avoid widening the state of inclusive finance development in different regions and provinces and the difference in income distribution within rural and urban areas. Specific measures to improve the state of inclusive finance development should also be different in different provinces. With a high level of growth in inclusive finance, greater focus should be placed on enhancing the usefulness of financial services in regions, striving to improve the actual utilization level of financial services and financial products for vulnerable groups, such as farmers, and ensuring that consumers, especially vulnerable groups, can obtain the required financial services in a reasonable way. However, the central and western provinces with a low degree of development for inclusive finance should focus on improving the penetration of financial services, speeding up the construction of rural financial infrastructure, and bringing more vulnerable groups into the modern payment and settlement system.

In economically underdeveloped areas, the central government can adopt the policy of "digital poverty alleviation", encouraging the growth of digital economy and the construction of inclusive financing, and support in cultivating industries, cultivating digital talents, establishing a digital infrastructure and guiding the creation of novel formats. In addition, the government can also promote mobile phones, information and network to the countryside, so as to promote residents' equal access to information and digital financial services.

5. Conclusion

This essay focuses primarily on the economic growth effect of the emergence of inclusive digital funding and its differences among regions with different economic development levels. This study builds the data panel quantile model for 31 provinces, and the research hypothesis is empirically tested by traditional regression. The following research conclusions are drawn: Firstly, the degree of regional economic development can be raised by the development of inclusive finance. Secondly, coverage breadth, usage depth and level of digitalization can promote economic growth. Among them, the coverage breadth plays the biggest part in reducing the disparity in regional economic growth,

while the usage depth plays the greatest role in promoting economic growth. Thirdly, the center and western regions are more affected by the growth of inclusive finance in relation to economic growth than the eastern regions are.

By studying the existing literature, it can be seen that there is still a lack of a unified explanation for the role of the secondary indicators of digital inclusive financing in economic development. This paper explains this problem and confirms that the growth of inclusive financing has important theoretical and practical importance since it can close the economic development gap. This paper's research can provide some reference for policy making to encourage the growth of inclusive digital financing and close the regional economic development gap, and then promote the development of regional economy.

In this paper, the above conclusions are obtained by analyzing the data of 31 provinces from 2016 to 2020, involving four independent variables and dependent variable, with a total data of 155, which is slightly less than other papers. In addition, when constructing the analysis model in this paper, there are no control variables, individual fixed effect, time fixed effect, etc., which may lead to inaccurate output of some results. In the next research, the data of provinces with wider time range will be quoted and added as control variables such as industrial structure, population growth rate, education level, investment level of fixed assets, fiscal expenditure level and macro tax burden level, and at the same time, the addition of individual fixed effects and time fixed effects will help this paper's conclusion even more.

References

- [1] Zhu Yiming, Wang Wei. How does inclusive finance achieve targeted poverty alleviation? *Financial Research*, 2017, 43(10): 43-54.
- [2] A Bootstrap Approach to Economic Development. *The Brookings Bulletin*, 1973, 2(10): 11-13.
- [3] Levine, Ross. Financial Development and Economic Growth: Views and Agenda. *Journal of Economic Literature*, 1997, 2(35): 688-726.
- [4] Yi Xin, Liu Fengliang. Financial development, technological innovation and industrial structure transformation: multi-sector endogenous growth theory analysis framework. *The Management World*, 2015, (10): 24-39+90.
- [5] Beck, Thorsten, et al. Access to Financial Services: Measurement, Impact, and Policies. *The World Bank Research Observer*, 2009, 1(24): 119-45.
- [6] Zhang Xun, Wan Guanghua, Zhang Jiajia, He Zongyi. The Digital Economy, Financial Inclusion, and Inclusive Growth. *Economic Research*, 2019, 54(08): 71-86.
- [7] Yi Hang Jian, Zhou Li. Whether the development of digital inclusive finance has significantly influenced the micro-evidence of household consumption from Chinese families. *Financial Research*, 2018, (11): 47-67.
- [8] Huang Yiping, Huang Zhuo. China's Digital Finance Development: Now and the Future. *Economics (Quarterly)*, 2018, 17(04): 1489-1502
- [9] Qian Haizhang, Tao Yunqing, Cao Songwei, Cao Yuyang. The Theory and Demonstration of Digital Finance Development and Economic Growth in China. *Quantitative, Economic, Technical and Economic Research*, 2020, 37(06): 26-46.
- [10] Xu Min, Zhang Xiaolin. The impact of inclusive finance on the income gap between urban and rural residents. *The Financial Forum*, 2014, 19(09): 9-15.
- [11] Zhou Li, Liao Jinglin, Zhang Hao. Digital financial inclusion, credit availability and resident poverty mitigation: Micro-evidence from Chinese household surveys. *Economic Science*, 2021, (01): 145-157.
- [12] Hu Angang, Wang Wei, Zhou Shaojie, Lu Yufeng. China creates a "new economy": from narrowing the "digital divide" to harvesting the "digital dividend". *Journal of the National Academy of Administration*, 2016(03): 4-13+2.